

PCT

FORM PTO-1390 (Modified)  
(REV 11-2000)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

TRANSMITTAL LETTER TO THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 U.S.C. 371

PRE-C218

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR

10/089313

INTERNATIONAL APPLICATION NO.  
PCT/IB00/01572INTERNATIONAL FILING DATE  
31 OCT 2000PRIORITY DATE CLAIMED  
05 NOV 1999

TITLE OF INVENTION

APPARATUS AND METHOD FOR PRODUCING A POLYOLEFINIC TRANSPIRING FILM

APPLICANT(S) FOR DO/EO/US

Fabrizio LORI and Graziano BORTOLETTO



Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (24) indicated below.
4. ☐ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
  - a. ☒ is attached hereto (required only if not communicated by the International Bureau).
  - b. ☒ has been communicated by the International Bureau.
  - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
  - a. ☒ is attached hereto.
  - b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
  - a. ☒ are attached hereto (required only if not communicated by the International Bureau).
  - b. ☒ have been communicated by the International Bureau.
  - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
  - d. ☐ have not been made and will not be made.
8. ☒ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
10. ☐ An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).
11. ☐ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☐ A copy of the International Search Report (PCT/ISA/210).

## Items 13 to 20 below concern document(s) or information included:

13. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☐ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☐ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
20. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
21. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
22. ☐ Certificate of Mailing by Express Mail
23. ☒ Other items or information:

Form PCT/IB/308

One (1) sheet of formal drawings

Form PCT/RO/101

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR

INTERNATIONAL APPLICATION NO.

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24. The following fees are submitted:

**BASIC NATIONAL FEE ( 37 CFR 1.492 (a) (1) - (5)) :**

- ☐ Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO ..... \$1040.00
- ☒ International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO ..... \$890.00
- ☐ International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... \$740.00
- ☐ International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) ..... \$710.00
- ☐ International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) ..... \$100.00

**ENTER APPROPRIATE BASIC FEE AMOUNT =****CALCULATIONS PTO USE ONLY**

\$890.00

\$0.00

Surcharge of \$130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE
Total claims	4 - 20 =	0	x \$18.00
Independent claims	2 - 3 =	0	x \$84.00

Multiple Dependent Claims (check if applicable). ☐**TOTAL OF ABOVE CALCULATIONS =**

\$890.00

☐ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.

\$0.00

**SUBTOTAL =**

\$890.00

Processing fee of \$130.00 for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).

+

\$0.00

**TOTAL NATIONAL FEE =**

\$890.00

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable).

☒

\$40.00

**TOTAL FEES ENCLOSED =**

\$930.00

Amount to be:  
refunded \$  
charged \$

- a. ☐ A check in the amount of \_\_\_\_\_ to cover the above fees is enclosed.
- b. ☐ Please charge my Deposit Account No. \_\_\_\_\_ in the amount of \_\_\_\_\_ to cover the above fees. A duplicate copy of this sheet is enclosed.
- c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 12-2174 A duplicate copy of this sheet is enclosed.
- d. ☒ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

**NOTE:** Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

George A. Loud  
LORUSSO & LOUD  
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(703) 739-9393

SIGNATURE

George A. Loud

NAME

25,814

REGISTRATION NUMBER

March 29, 2002

DATE

APPARATUS AND METHOD FOR PRODUCING A POLYOLEFINIC TRANSPIRING FILM  
\*\*\*\*\*

The present invention relates to an apparatus and method for producing a polyolefinic transpiring film, capable of allowing vapour and air to pass therethrough while being impermeable to liquids. The patent EP 0.283.200 B1, to which reference is made for a general view of the prior art, describes a method for producing transpiring films in which a linear polyethylene extrusion at low density (LLDPE), charged with  $\text{CaCO}_3$ , is first heat-embossed, for providing reduced thickness imprints, and then stretched to obtain a transpiring film with a particularly elevated transpirability in the reduced thickness zones.

From US-A-4277594 it is known a method for producing a polyethylene extruded film wherein a bubble passes through a collapsing station where it is drawn through a pair of nip rollers to produce a flat film which is then heated and successively stretched.

EP-A-363937 discloses a process for making a transpiring film wherein an annular film is folded in such a manner as to form a flat shape which is first heated, then stretched and successively cooled.

Transpiring films according to the prior art moreover have various problems and drawbacks.

One problem which is encountered in known polyolefinic transpiring films is the possible formation of micro-holes during the stretching phase of the film, which formation is due to the presence of impurities, in particular oxidised and carbonised particles.

Such impurities may already be present in the mix to be extruded, or they may form during the extrusion process of the polyethylene.

The micro-holes, which have an average diameter between 0.2 and 2 mm, may compromise the liquid impermeability characteristics; such risk increases with the speed of the stretching process and with the increase in the degree of stretching of the film.

Another problem which is encountered in polyolefinic transpiring films is the non-uniformity of the transpirability.

A principle aim of the present invention is to provide a method and an apparatus for producing a polyolefinic transpiring film which allow to overcome at least part of the above cited problems.

Such aim is obtained by means of a method in accordance with the claim 1 and by means of a plant in accordance with claim 4.

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12

13-09-2001

Further embodiments of the method may be carried out in accordance with the dependent claims 2 and 3, and further embodiments of the plant may be carried out in accordance with the dependent claims 5 and 6.

The method and the apparatus according to the invention will appear in a clear manner from the following description of one possible embodiment, provided in a purely indicative manner, together with the drawing figure which shows, in a schematic view, a manufacturing plant in accordance with the invention.

The present method provides for the use of a mix preferably of linear polyethylene at low density (LLDPE) charged with a base of  $\text{CaCO}_3$ .

Alternatively, it is possible to use linear polyethylene at low density (LLDPE) or polyethylene at medium density (MDPE).

It is also possible to use copolymers of polyethylene having  $\alpha$ -olefin with 4-10 atoms of carbon (1 butene, 1 pentene, 1 esene, 1 eptene, 1 ottene, 4 metil, 1 pentene).

Naturally, it is also possible to use other types of charges, organic or inorganic, having dimensions between 0.6 and 6  $\mu\text{m}$  and treated in a way to render their surfaces hydrophobic.

In particular, it is possible to use: clay, kaolin, zeolite, Zn, Al, Ca,  $\text{CaSO}_4$ ,  $\text{BaSO}_4$ , MgO,  $\text{Mg}(\text{OH})_2$ ,  $\text{TiO}_2$ .

The quality of the added charge depends also on the degree of desired traspirability, normally the charge constitutes from 30% to 70% by weight of the mix.

Such mix is bubble-extruded (so-called blow moulding), by means of a circular-head extruder 1 in order to obtain a tubular 10.

The temperature of the tubular exiting from the extruder 1 is between 150-230°C and, preferably, between 170-190°C.

The ratio of expansion of the tubular 10 may vary between 1:2 and 1:4, and preferably is 1:3.

One characteristic of the method of the present invention is the fact that the extruded and expanded tubular 10 is subjected to a calendering operation.

In detail, the tubular 10 enters, at a temperature of about 80-100°C, in a first calender 2 where it is compressed and stretched into the form of a sheet 11, constituted by two superimposed layers, assuming a width equal to half of the circumference of the tubular and a thickness which is double with respect to the thickness of the tubular.

Such characteristic has the advantage of resolving the problem of insufficient liquid impermeability due to the micro-holes which may form in the films during the stretching phase: it is in fact extremely improbable that both the layers of the film are damaged at the same point. The calender 2 used for flattening the tubular 10 comprises a pair of smooth coupled rollers of which the first one is chromed steel and the second one is rubber with a hardness of 60-80 shore; the pressure supplied by the calender 2 on the flattened tubular 10 varies between 5 and 10 kg/cm<sup>2</sup>.

A second characteristic of the method according to the invention consists in the fact that after having been flattened, the film 11 is heated up to a softening temperature.

Such temperature depends on the type of mix which is extruded, in the case of an LLDPE base mix it may vary between 80 and 130 °C and usually, it is around about 100 °C.

The heating executed in this manner favours the removal of humidity or of additives present in the mix which have a low evaporation point.

Moreover, the heating executed in this manner favours the elimination of micro-stresses present in the film due to the preceding phases of the method and favours the homogenisation of the internal structure of the film.

In order to obtain the heating, the film 11 is first made to run on heated rollers 3, having a temperature of about 60-70 °C, and then made to pass near infrared ray lamps 4 which further increase the temperature up to the point of softening.

In fact the use only of the heated rollers - normally heated with water or oil - does not allow to reach the softening temperature, or at least with great difficulty.

Moreover, the infrared lamps provide the advantage of also strongly heating the layer of air about the film 11 (typically up to 300-400 °C) which therefore permits to completely eliminate the residual humidity still present on the film 11.

A third characteristic of the method according to the invention consists in the fact that the film heated in this manner is further calandered by a calender 5 and, thereafter, cooled to a temperature between 8 and 30 °C.

Such cooling is carried out, preferably, through contact by means of one of the rollers of the calander 5, which is maintained at a constant temperature between 8 and 30 °C.

The further calendering permits, through the compression provided by the rollers, to intimately unite the two original layers so as to avoid the risks of de-lamination of the film produced in this manner, and the thermal shock to which the film is subjected permits to block the stabilisation process.

It is also possible, in this phase, to carry out an embossing operation of the film for a purely aesthetic purpose which does not modify the weight of the film.

It has been found that the thermal shock to which the film is subjected allows to obtain an improved transpirability during the successive stretching operations.

The compression of the film is obtained by coupling a chromed-steel roller coupled with a rubber roller (hardness 60-80 shore).

Successively to the process of sterilisation, the film 11 is subjected to transverse and/or longitudinal stretching.

For such purpose, there are present appropriate means 6 adapted to carry out the transversal stretching and appropriate means 8 adapted to carry out the longitudinal stretching.

In the illustrated example, the film 11 is subjected first to a transversal stretching and then to a longitudinal stretching: naturally these phases may also be inverted.

Preferably between the transversal stretching means 6 and the longitudinal stretching means 8 there are provided tentering means 7 for eliminating the folds created by the first process of stretching.

Normally, the ratio of longitudinal stretching varies between 1:1.5 and 1:2.5.

Also in this manner, the ratio of longitudinal stretching varies, usually, between 1:1.5 and 1:2.5.

However, if required, the ratio of stretching may also arrive to a ratio of 1:4.

At the end of the stretching phase, the film 11 may undergo further working steps or be wound up by an appropriate winding machine 9.



## CLAIMS

1. Method for producing polyolefinic transpiring films comprising the steps of:

- bubble extruding a mix of charged LLDPE;
- flattening the tubular (10) in order to obtain a flat film (11),
- heating the flat film (11) up to a softening temperature;
- compressing the flat film (11) in order to unite the two original layers;
- cooling the flat film to a temperature between 8-30 °C; and
- transversal and/or longitudinal stretching of the flat film (11).

2. Method, according to claim 1, wherein the flat film (11) is first heated by conduction and successively by irradiation.

3. Plant for producing a stretched polyolefinic film comprising, in succession:

- a bubble extruder (1);
- a first calender (2) adapted to flatten the extruded tubular;
- means (3,4) adapted to heat the flat film (11) up to a softening temperature;
- a second calender (5) adapted to compress the heated film and unite the two original layers of the heated film;
- means (5) adapted to quickly cool the film up to a temperature comprised between 8-30 °C;
- means (6) adapted to transversally stretch the film and/or means (8) adapted to longitudinally stretch the film.

4. Plant, according to claim 3, wherein said means adapted to heat the flat film (11) comprise, in succession.

first heating means, adapted to heat the film by conduction; and

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second heating means adapted to heat the film by irradiation.

NAME	AGE	SEX	REL	DATE	TIME	PLACE	REMARKS
JOHN	25	M	SON	1945	10:30	NEW YORK	ARRIVED
MARY	22	F	DAUGHTER	1945	11:00	NEW YORK	ARRIVED
JOHN	25	M	SON	1945	11:30	NEW YORK	ARRIVED
MARY	22	F	DAUGHTER	1945	12:00	NEW YORK	ARRIVED
JOHN	25	M	SON	1945	12:30	NEW YORK	ARRIVED
MARY	22	F	DAUGHTER	1945	13:00	NEW YORK	ARRIVED
JOHN	25	M	SON	1945	13:30	NEW YORK	ARRIVED
MARY	22	F	DAUGHTER	1945	14:00	NEW YORK	ARRIVED
JOHN	25	M	SON	1945	14:30	NEW YORK	ARRIVED
MARY	22	F	DAUGHTER	1945	15:00	NEW YORK	ARRIVED
JOHN	25	M	SON	1945	15:30	NEW YORK	ARRIVED
MARY	22	F	DAUGHTER	1945	16:00	NEW YORK	ARRIVED
JOHN	25	M	SON	1945	16:30	NEW YORK	ARRIVED
MARY	22	F	DAUGHTER	1945	17:00	NEW YORK	ARRIVED
JOHN	25	M	SON	1945	17:30	NEW YORK	ARRIVED
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MARY	22	F	DAUGHTER	1945	19:00	NEW YORK	ARRIVED
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MARY	22	F	DAUGHTER	1945	20:00	NEW YORK	ARRIVED
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MARY	22	F	DAUGHTER	1945	21:00	NEW YORK	ARRIVED
JOHN	25	M	SON	1945	21:30	NEW YORK	ARRIVED
MARY	22	F	DAUGHTER	1945	22:00	NEW YORK	ARRIVED
JOHN	25	M	SON	1945	22:30	NEW YORK	ARRIVED
MARY	22	F	DAUGHTER	1945	23:00	NEW YORK	ARRIVED
JOHN	25	M	SON	1945	23:30	NEW YORK	ARRIVED
MARY	22	F	DAUGHTER	1945	24:00	NEW YORK	ARRIVED

## ABSTRACT

The invention relates to a method and a plant for producing polyolefinic transpiring films by means of bubble extrusion of a charged LLDPE mix, flattening of the extruded tubular in order to obtain a flat film and transversal and/or longitudinal stretching of the flat film.



**Fig. 1**

COMBINED DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that:

This declaration is of the following type:

- ☐ original
- ☐ design
- ☐ supplemental
- ☒ national stage of PCT
- ☐ divisional
- ☐ continuation
- ☐ continuation-in-part (CIP)

My residence, post office address and citizenship are as stated next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed for and for which a patent is sought on the invention entitled:

APPARATUS AND METHOD FOR PRODUCING A POLYOLEFINIC TRANSPIRING FILM

the specification of which

- ☐ is attached hereto
- ☐ was filed on \_\_\_\_\_, as Application Serial No. \_\_\_\_\_ and  
was amended on \_\_\_\_\_
- ☒ was described and claimed in PCT International Application No. PCT/IB00/01572  
filed on October 31, 2000 and as amended under PCT Article 19 on March 7, 2001.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any Amendment referred to above.

I acknowledge duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Sec. 1.56.

- ☐ In compliance with this duty there is attached an information disclosure statement. 37 CFR 1.97.

I hereby claim foreign priority benefits under Title 35, United States Code, Sec. 119, of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent of inventor's certificate having a filing date before that of the application on which priority is claimed:

☐ no such applications have been filed  
☒ such applications have been filed as follows.

Prior Foreign Application

<u>MI99A002318</u>	<u>ITALY</u>	<u>5 11 1999</u>	<input checked="" type="checkbox"/> <input type="checkbox"/>
(Number)	(Country)	(day/month/year filed)	Yes No

I hereby claim the benefit under Title 35, United States Code, Sec. 120 of any United States application(s) listed below, and insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Sec. 112, I acknowledge the duty to disclose all information known to be material to patentability as defined in Title 37, Code of Federal Regulations, Sec. 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

_____ (Application Serial No.)	_____ (Filing Date)	_____ (patented, pending, abandoned)
_____ (Application Serial No.)	_____ (Filing Date)	_____ (patented, pending, abandoned)

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agents to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

George A. Loud, Reg. No. 25,814  
Anthony M. Lorusso, Reg. No. 25,059

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Alexandria, VA 22305

Direct Telephone calls to:  
  
George A. Loud  
(703) 739-9393

I hereby declare all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first inventor 1-00 LORI Fabrizio

Inventor's signature [Signature] November 30, 2001

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Citizenship Italian ITX

Post Office Address Same as above

Full name of second joint inventor, if any 2-00 BORTOLETTO Graziano

Inventor's signature [Signature] November 30, 2001

Residence via Pietro Micca, 5 I-31059 ZERO BRANCO (TV) ITALY ITX

Citizenship Italian

Post Office Address Same as above

Full name of third joint inventor, if any \_\_\_\_\_

Inventor's signature \_\_\_\_\_ (Date)

Residence \_\_\_\_\_

Citizenship \_\_\_\_\_

Post Office Address \_\_\_\_\_